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Challenges of Disease Management in Small Scale Fish Farms in Lagos State, Nigeria

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Abstract

The study examined diseases prevalence, treatment and management problems in small-scale fish farms in Lagos State, Nigeria. Snowball sampling technique was used to select seventy-two (72) fish farmers from two local governments in the state. Data were collected using structured interview schedule. Percentage, mean scores and standard deviation were the statistical tools used for data presentation and analysis. Results show that water pollution (76.4%) was the major cause of disease in farms. The prevalent diseases reported by farmers were fin and tail rot (75.1%), Ichtyophthirius (white disease) (66.4%), head and lateral line erosion (HLLE) (55.1%), and swim bladder disease (53.8%). The farmers used both traditional and orthodox measures in treating the diseases. The major challenges to health management in farms were poor access to good water sources, increase causal agents, scarcity/poor access to drugs and purchase of adulterated drugs. The study recommends that agricultural development agency should strengthen technical assistance and extension services to farmers. Also, agencies like Fisheries Society of Nigeria (FISON), State Department of Fisheries (SDF)) among others should strategically organize seminars, workshops, conferences and advisory service particularly in times of outbreak to combat spread and broaden knowledge and skills of fish farmers on safe disease treatment and health management practices.

Keywords: fish, disease, treatment, health, management, small scale

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Introduction

Since ancient times, fishing has been a major source of food for humanity and a provider of employment and economic benefits (Bene, 2006), thereby making crucial contributions to the world's well-being and prosperity. The dietary contribution of fish is crucial in terms of animal protein, as a portion of 150 g of fish provides about 50–60 percent of the daily protein requirements for an adult (FAO, 2014). In 2010, fish accounted for 16.7 percent of the global population's intake of animal protein and 6.5 percent of all protein consumed, also providing about 3.0 billion people with almost 20 percent of their average per capita intake of animal protein and 4.3 billion people with about 15 percent of such protein (Thilsted, 2012). In many low-income countries with water and fisheries resources, fish is important for livelihoods, income and as food for the rural poor, who suffer disproportionately from malnutrition, including micronutrient deficiencies (Thompson and Subsinghe, 2011).

Globally, it is clear that demand for fish outweighs the supply. Fish catch is not as high as would be expected, and the volume of caught has been decreasing in recent years. FAO (2010) reported that 53% of ocean/marine catch were fully exploited, 28% overexploited, 3% depleted, and 1% were recovering from depletion. This means that 85% of marine fisheries are biologically incapable of sustainably supporting increase yields (FAO 2010). Aquaculture particularly fish farming has emerged as the world leading alternative source of food fish for the population. It has proved to be an important sector in Nigerian economy and a successful method of enhancing fish production in the entire world (FAO, 2002; IFPRI, 2003). According to the FAO (2014) statistics, aquaculture contribution in 2012 was 90.43 million tonnes, including 66.63 million tonnes of food fish, 23.78 million tonnes of aquatic algae (mostly marine macro algae / seaweeds), and 22.4 thousand tonnes of non-food products (pearls and shells, etc.). Nevertheless, global per capita fish consumption has continued to increase due to increase population, income and change in food preference.

Nigeria is highly endowed with large rivers, small water bodies and some natural springs with both fresh and marine fishery resources. It has a coastline of 3,122km shared by 8 states (Lagos, Ogun, Ondo, Delta, Bayelsa, Rivers, Akwa-Ibom and Cross River) out of a total of 36 states in the country (Tijani, 2011). FAO (2012) reported that Nigeria has the resource capacity to produce 2.4 million MT of fish every year and aquaculture industry has experienced increasing growth. However, output from fish farming is inadequate because of the country's high demand for fish of 1.5 million metric tons (MT) and a per capital consumption of 7.5-8kg annually (Federal Department of Fisheries, 2008). Nzeka (2014) reiterates that Nigerian's population of 170 million people may exceed 210 million by 2020, and the demand for fish protein is expected to grow by another 700,000 metric tons over the same period. FAO (2010), showed that Nigerian current fish consumption is 7.5 kilo per person against global fish consumption at 18.7 kilos per person, implying that the country's current consumption shortfall per person is still large at 11.2 kilos per person.

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Lagos State has witnessed in more recent times the proliferation of small scale fish farms in the peri- urban and rural areas of the state. Fish farming has been promoted as a low external input technology benefiting from availability of natural resources and optimal local conditions, such as high water table, good soil structure and texture for the construction of fish ponds, and an abundance of kitchen wastes that can easily be converted to fish feed ingredients. Moreover, the Lagos State Development Authority (LSADA) has directed extension efforts to enhance fish production, covering issues such as the preparation of feed rations using locally available feed ingredients, construction of homestead fish ponds with locally available materials, integration of commercial fish farming with the urban population's daily activities, the production of fingerlings, as well as, marketing issues, record keeping, disease and health management, and the linkage with financial institutions for credit sourcing (Basorun and Olakulehin, 2007).

However, disease appears to be one of the major threats to fish production in the country and Lagos State in particular. The challenge is expected to worsen with increasing effects of climate change on aquatic life and the environment. Agnew et al., (2009) however, opine that several factors contribute to the disease problems encountered by small scale fish farmers. These include unstable conditions brought about by sudden changes in weather, such as heavy rain after a long dry season; the irresponsible use of chemical disinfectants and antibiotics is also increasingly recognized as having potential environmental impacts. Others include intensive culture practices with poorly controlled feed use and waste product, lack of technical knowledge relating to proper husbandry and health management, particularly for new entrants. These characterised most small scale fish farms spread across the state and possibly explains the increasing disease risk and cycles of infections observed in farms. Thus, regular investigation and research on diseases and management issues is apt for informed policy, tailored training and targeted advisory services to farmers especially with increasing new entrants in fish farming. Therefore, the study sought to examine challenges in disease management in small scale fish farms in Lagos State. The research objectives were specifically to:

1. identify common diseases in small scale fish farms;
2. describe treatment measures adopted by farmers and
3. ascertain the challenges of disease and health management in small scale fish farms.

Methodology

The study was conducted in Lagos State, Nigeria. The state is located between longitude 3°45 and 3.75°East and latitude 6°35 and 6.58°North with land mass of about 3,577 square kilometres, and about 787squares constituting lagoons, swamps, marches and creeks. This gives the state a comparative advantage over other states of the Federation for fish farming and related activities. The state is divided into five administrative divisions namely Ikeja, Lagos, Badagry, Ikorordu and Epe division. These divisions were further divided into twenty political local government areas. Small scale fish farmers in Lagos State constituted the population for the study. Multistage sampling technique was used to select respondents for the study. In the first stage, Ikorodu and Alimosho local government areas (LGAs) were purposively

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selected from the twenty LGAs in the state based on their popularity in fish farming. In the second stage, four towns dominated by fish farmers were selected from each local government area, giving a total of eight (8) towns for the study. Ten small-scale fish farmers were selected from each town community using snow ball sampling technique, giving a total of 80 fish farmers for the study. However, a total of 72 respondents that cooperated with the researcher during the interview process were used for analysis. A structured interview schedule was developed, validated and employed in data collection based on the objectives of the study. Camera and tape recorder were used to take pictures and record discussion with respondents.

To identify common diseases and treatment in small scale fish farms, information on the status of farms in terms of occurrence of fish death, stage of significant death, and persons consulted were elicited. Secondly, respondents were asked to describe the signs and symptoms of diseases they have observed in their farms, and the responses/ treatment applied in the past two years. Pictures of some infested fishes were taken for clearer identification and subsequent naming of disease. The researcher with the help of a fish expert identified the type and particular disease based on the signs and symptoms described by the respondents and pictures taken by the researcher. The respondents further indicated the health management challenges encountered in their farms on a three point Likert- type scale with response options of very serious (3), serious (2) and not serious (1), giving s mean score of 2. Data collected were presented using percentage and mean scores. Responses with mean score less than 2 were regarded as not serious problems, while items with mean score ≥ 2 were regarded serious problems. The IBM-SPSS statistics constituted the software package used for the analysis.

Results and Discussion

Disease Incidence, Age of Occurrence and Source of Medication

All (100%) the respondents had experienced death of fishes in their farms (Table 1). Fish death could be attributed to a number of factors and reasons such as stress through extreme or toxic condition, poor water quality, disease organisms, improper feeding among others. It is often the visible signs of environmental or management problems. Also, when early symptoms of diseases are not properly managed, it can lead to the death of a significant number of fish in farms, constituting a huge loss to farmers. Most times when few dead fishes are floating on the surface of a pond, it is not necessarily a cause for alarm as it might be due to old age or stress. However, when large numbers of fish of all sizes are found dead and dying over a long period of time, it is necessary to investigate and determine the cause, in order to apply the best measures for their treatment.

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Table 1: Distribution of respondents based on disease incidence, causes, and source of advice

Variable	Percentage
Incidence of fish death	
Yes	100
No	0
Cause of disease in farm*	
Environmental	11.1
Natural	6.9
Water Pollution	76.4
Feed Contamination	55.6
High stocking density	19.4
Electrical failure	12.5
Infection	37.5
Stage of growth of significant loss to disease	
Fry	40.8
Fingerling	28.8
Juvenile	15.9
Adult	14.4
Persons consulted during disease outbreak*	
Veterinarians	12.5
Research institutes	6.9
Fellow Farmers	55.6
Self Medications	34.7
Local/Private Dealers	4.2
Extension Agents	5.6
Professionals(Universities)	5.6

***multiple response**

Cause of Disease in Fish Farm

The respondents (76.4%) indicated that water pollution was the major cause of fish diseases in pond, while a lesser proportion (55.6%, 37.5%, 19.4%, 12.5%, 11.1%, and 6.9%) attributed it to feed contamination, infection, high stocking density, electrical failure, environmental and natural factors, respectively (Table 1). Water pollution is one of the major reasons why fishes are predisposed to disease because the entire life process of fish wholly depends on the quality of its environment. These include the biological, chemical and physical quality of water, ranging from PH, dissolved oxygen and temperature, as well as colour and transparency. According to Sadler and Andrew (2007), the safest water for fish production is water pumped from a well to pond through a height. Water that is re-circulated or reused on the farm for different batches of fish is not likely to be the source of new diseases, but it may enable existing pathogens to accumulate in either the fish or intermediate hosts. River water is the least desirable source of water for fish farming because it is likely to contain pathogens not already present in the fish farm. It can only be used when pumped through a fine filter and held in fish-free ponds for at least 21 days before use. This will interrupt the life cycles of parasites, bacterial or viral pathogens that cannot survive without a suitable fish host.

Also, feed contamination, in terms of feeding expired or contaminated feed, over feeding and underfeeding, feeding wrong size of feed is critical to fish production.

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According to White (2013), feed costs account for up to 60 percent of total production costs, and inappropriate feeding and feed management can affect profits of farmers. Nutritional imbalances, underfeeding and overfeeding lead to reduced fish performance and predispose fish to diseases. (Bureau et al., 2006). High stocking density can also predispose fishes to diseases due to competition for survive. Fish disease can be caused by microbes or management related factors, from pond to pond or farm to farm by the transfer of infected fish and by animals, people, equipment and contamination by infected fish or fish pathogen.

Loss of Fish to Diseases

The respondents experienced significant loss of fish to diseases at the fry (40.8%) and fingerling (28.8%) stages (Table1). A lesser proportion (15.9% and 14.4%)) observed diseases at juvenile and adult stages of production, respectively. This shows that incidence of diseases in farms decreases with age, perhaps due to differences in the development of the fishes. The results corroborate with Sharma et al., (2012), who stated that disease is a prime agent affecting fish mortality especially when fishes are young. The younger ones like fries are more susceptible to disease infestation due to poorly developed organs, which limit the ability to fight disease conditions. Morphological transformation (pigment pattern, body shape, fin and eye migration), makes them prone to diseases and inhibits their growth and development. On the other hand, the adult fish is less susceptible because it is fully matured with all organs functioning and sometimes can survive in the most adverse conditions.

Source of Advice During Disease Outbreak

The respondents consulted fellow farmers (55.6%) and carry out self-medication (34.7%) during disease outbreak. Fish famers prefer to consult fellow farmers in times of disease outbreak especially the ones that have more experience, probably because it is easier, faster and cheaper. Similarly, self-medication could be cheaper, but its consequence may be huge especially when the farmer is illiterate and new in the business. The use of veterinarians, research institutes, extension agents and professionals is not common. This could be attributed to economic, institutional and financial problems. Most of the respondents did not contact them, perhaps because of the belief that small-scale farmers are not given serious attention, while others could be due to poor linkage and interaction or proximity to these institutions.

Disease Prevalence and Treatment in Fish Farms

Bacterial diseases

The most prevalent bacterial diseases reported by respondents were fin or tail rot (7 times), *myxobacteriosis* (5 times) and *septicaemia* (5 times). A significant proportion (75%) of farmers had experienced fin or tail rot (75.1%), *septicaemia* (38.2%), *Myxobacteriosis* (30.5%) diseases in their farms. (Table 2). Although a significant proportion (48.6%) of farmers indicated occurrence of tuberculosis in their farms, however, it is relatively less common. The results agree

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Table 2: Prevalent bacterial, fungi and viral diseases and treatment in small scale fish farms

Signs/symptoms	Percentage	Prevalence	Disease	Treatment
Bacterial				
Swelling of the head and bulging eyes	20.7	2	Corney bacteriosis	Treat first with salt then if symptoms persist, then treat with antibiotics like oxytetracycline
Rotted or decaying fin and/or tail	75.1	7	Tail and fin rot	Drain pond and put water up to one block then treat with antibiotics (oxytetracycline or chloramphenicol) and also check the pH of the water and correct if needed
Inactivity, loss of colour or appetite, weight loss, skin defects	48.6	4	Fish Tuberculosis	Disinfect tank, net, etc. to prevent transmission. Wash hands and surfaces well. Antibiotics like oxytetracycline are used in in severe conditions
Erratic swimming, bloating or swelling in body Fish cluster near water inlets of ponds and even try to jump out	30.5	5	*Myxobacteriosis*	Use salt. Keep up on water maintenance to prevent it
Sluggishness, lack of appetite, fin damage, reddish discoloration, and bulging eyes	38.2	5	*Septicemia*	Antibiotic treatment in food form is required.
Fungi				
Grayish white color on skin, damaged fins, and the tissue on the head may be eaten away	28.7	2	Cotton wool disease	Treat immediately with antifungal drug and disinfect tanks and equipments
White or gray fungus on eyes, swelling ulceration.	23.5	2	Cataracts	Antibiotics like eye fungex or any other fungicide.
Viral				
Swelling of abdomen and raised scales around the swollen area	13.6	4	Dropsy (Malawi Bloat) may be caused by internal bacterial infection (if swelling is sudden), parasites, or cancer (if swelling is gradual).	Used 1/8 teaspoon of industrial salt for every 5 gallons of water and monitor for two weeks. Check for signs of bacterial infection or parasites for further treatment.

with FAO (2014) that in virtually every type of aquaculture, bacterial disease rank number one among etiological agents. Fin and/or tail rot is caused by the *Aeromonas sp* and *pseudomonas sp* of bacteria, which if unchecked leads to death of the infected fishes. In times of outbreak, farmers drain pond, put fresh water up to one block, add salt and leave for one hour or two, drain again and pour fresh water and also check the water quality parameters. Farmers also apply antibiotics especially *Oxytetracycline* when infection is very severe. But according to Pandey et al. (2012), since water quality plays a vital role in the prevention and cure of this disease, it is better to perform a large water change (30-50%) with thorough gravel cleaning in order to remove excess detritus and waste from the substrate than initial dosing of any chemical or medication as this would risk further damage to the gills of the fish. Similarly, other bacterial diseases like fish tuberculosis and others were treated by water management, disinfecting equipment/ponds or by use of antibiotic in severe cases.

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However, the use of antibiotics needs to be administered with caution due to the residual effects and its consequences on public health when withdrawal periods are not observed by farmers. Worst still, are the indiscriminate use and access to adulterated drugs, which also affect efficiency and the cost of production.

Fungi disease

Fungal disease is not very common in fish farms. Respondents reported two occurrences in the last two years in their farms. Only about 29% and 24% of farmers had observed cotton wool disease and cataracts diseases, respectively. The result is contrary to report by Foster and Smith (2015) who reported that fungal infections are among the most common diseases seen in fish, because these fungal spores are found in all fish. Cotton wool disease is a result of fungal infections that affect the skin, fins and mouth. The fluffy white growth often colonizes areas where there have been previous infections, parasites or injuries. The treatments applied by farmers were use of antifungal drugs and salt. Foster and Smith (2015) reveal that the best approach is the disinfection of equipment used in the farm and keeping the environment clean as this is more cost effective but takes hard work and consistency. Cataracts are fungal growth which causes the lens to become opaque and does not transmit light efficiently. Farmers treat cataract with antifungal drugs like eye fungex or any other fungicide which is very risky as farmers might not know the correct therapeutic dose. Foster and Smith (2015) reported that providing a balanced diet with food that is fresh (commercial food less than 6 months old) can help prevent cataracts.

Viral disease

Dropsy (13.6%) was the most prevalent (4 times) viral disease reported by the respondents (Table 2). The primary cause is the accumulation of excessive fluid in the tissues or inadequate elimination of water from the system. The use of salt to treat dropsy were reported as very efficient and effective by farmers, as it has the property of extracting extra water out of belly and improves the overall health of the fish. Also, antibacterial diet which is a mixture of antibiotic such as tetracycline with fish food for at least 10 days was also reported as very effective by the farmers.

Prevalent Parasitic Diseases and Treatment.

The most prevalent (5 times) parasitic diseases reported by the respondents were *Ichthyophthirius* (white disease) (66.4%), and *epistylis* disease (40.6%). The respondents indicated that anchor worms (50.7%), tape worm (47.9%), *trichodiniasis* (33.5%), and fish lice (28.2%) occurred only twice in their farms in the last two years (Table 3).

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Table 3: Prevalent parasitic diseases and treatment in small scale fish farms

Symptom	%	Preva-lence	Disease	Treatment
Lesions (wound) on the body	50.7	4	Anchor worms	Drain pond and disinfect with lime till the symptom disappear
Restlessness and discomfort Rubbing body on pond bottom	34.3	3	Fluke disease	Apply formalin or malachite green
Fish restless Red spot on point of infection Mass mortality	28.2	4	Fish Lice	Drain ponds, add a little water up to one block then apply industrial salt. But if the symptom persist disinfect pond with lime for 2 weeks. Formalin and malachite green can also be used.
White spots on the body Restlessness of fish by rubbing body on pond wall	66.4	5	*Ichtyophthirias* (white disease)	Drain pond then apply formalin., OTC Medication can also be used.
Bloated stomach Fish becomes restless, losses weight or become inactive	47.9	4	Tape worm	Drain pond and disinfect with salt. Apply antibiotics mixed in the feed.
Irregular white patches on head or body, scratching, stop feeding and may isolate themselves	33.5	4	*Trichodiniasis*	Salt treatment.
Yellow to dirty white spots on skin	40.6	5	*Epistylis* disease	Dip fish in salt solution

Ich is a common name for the parasite *Ichthyophthirius multifiliis.* Fish infected with *Ich* may have white specks on their skin as though they were sprinkled with salt. Early diagnosis and treatment are essential for controlling *Ich* and reducing fish losses. Fish farmers treat fishes and fish pond by draining pond, put a little water that covers fishes and then add salt or formalin. They also indicated use of oxytetracycline because of its resistance to treatment. This is because not all stages in the life cycle of *Ich* are affected by treatments (Durborow et al., 1998). Therefore, multiple treatments must be administered to catch individual *Ich* organisms at the vulnerable stages of their life cycle and this requires early diagnosis by farmers.

The anchor worms of the *Lernea sp* is a parasitic disease characterised by lesions on the body of the fishes as a result of parasite burrowing into the fish skin. The affected fish were removed and destroyed, and the pond disinfected by applying lime for one to two weeks. Other parasitic diseases identified in farms were treated with either salt, disinfected with lime, parachute or formalin.

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Management-Related Diseases Problems

The most prevalent management- related diseases problems were water borne irritant (40.6%), lower dissolved oxygen (65.7%), water borne irritant (40.6%) head and alkaline/acidic water (36.4%). These diseases occurred 5-7 times in fish farms in the last two years. Other management- related problems observed by farmers included lateral line erosion (55.1%), water borne irritant (40.6%), but they are not very common in farms (Table 4).

The problems are mostly caused by over fertilization, causing algal bloom, low or high pH, poor nutrition, stress during transportation, sorting and poor water quality. According to Bolorundoro and Abdullahi (2013) conditions that favour the occurrence of management related diseases/problems in fish culture include lack of technical know-how on management practices, erratic feeding, algal bloom due to over fertilization, rough handling of fishes and unhealthy pond environment. Specifically, lower dissolved oxygen is caused by over fertilization, leading to algal bloom. The typical signs and symptoms are that fish regularly come out to gasp for atmospheric air and mass mortality of fish with wide-open mouth and gills apart. The disease was treated by draining pond using high intensity, the bottom of the pond is flushed out then fresh water is poured into the pond. Head and lateral line erosion (HLLE) is caused by poor feed, in terms of nutritional deficiency of vitamin C, D, calcium and phosphorus and insufficient change of water.

Table 4: Prevalent management related diseases/problems and treatment in small scale fish farming

Signs/symptoms	%	Prevalence	Problem	Treatment
Fish regularly come out to gasp for atmospheric air Mass mortality of dish with wide-open mouth and gills apart	65.7	6	Lower dissolved oxygen (DO)	Drain water and flush out the bottom of the pond. Then put a fresh water
Rubbing of flesh against pond walls	40.6	5	Water borne irritants	Prevent pollutants from getting to pond water.
Mortality of fishes without any visible sign	38.6	5	Alkaline water Acidic water	Apply lime or soda ash to increase the water Ph Reduce the Ph with calcium carbonate or sodium chloride
Lesions on fish and reduced metabolic activities	49.7	7	Traumatic injuries	Handle fish with care
Fish having difficult time staying upright and may hang vertically in water	53.8	6	Swim bladder disease	Stop feeding for sometimes to monitor fishes and also check water quality.
Crack or hole in the head	55.1	4	Head and lateral line erosion (HLLE)	Disinfect tank and put fresh water Mix their feed with the nutrients that they are deficient.eg minovit
Dark colour of eyes, skin, gills and mouth of adult fish.	19.8	4	Gas-bubble disease	Proper aeration of pond with an aerator pumps. Ensure proper application of feeds, limes, fertilizers at an appropriate rate.

It is characterised by a crack in the skull which makes fish weak, thereby resulting in cannibalism. It was treated by applying industrial salt in the pond and immersed fish

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in it for some time. Also, their feed is mixed with the deficient mineral (calcium, phosphorus) and vitamin C and D (eg minovit). Management problems like lower dissolved oxygen, alkaline or acidic water, water borne irritant and others were handled through good health management practices and proper fish care.
In addition, the respondents (90%), reported that sometimes the barbells of their fishes turned white and then starts withering and it was treated with oxytetracycline, mixture of ginger and garlic and left in a reduced amount of water for hours. This symptom could not be classified into the main categories of fish disease indicated by the respondents.

Challenges in disease and health management in small scale fish farms

Table 5 shows that the serious challenges in disease and health management in small scale fish farms were poor access to water resources ($\bar{x}$=2.00), increasing causal agents ($\bar{x}$ =2.19), scarcity/poor access to drugs ($\bar{x}$ =2.31), and purchase of adulterated drugs ($\bar{x}$ =2.13). The standard deviation was less than one, indicating homogeneity in the responses of the farmers.

Table 5: Challenges in disease and health management in small scale fish farm

Variable	Mean (M)	Standard deviation (SD)
Inadequate capital	1.22	0.54
Inadequate information on management practices	1.49	0.58
Poor access to quality water resources	2.00*	0.89
Increased causal agents	2.19*	0.82
Limited knowledge on diseases and health management in fish farming	1.39	0.57
Poor access/irregular extension services	1.68	0.77
Weak linkages with research institutes, universities and others.	1.72	0.76
Lack of access to improved breeds	1.86	0.78
High cost of treatment	1.72	0.74
High cost of quality feed	1.18	0.45
Poor road network/transportation	1.90	0.81
Labour intensive	1.90	0.65
Scarcity/ poor access to drugs	2.31*	0.69
Negligence of the farmers	1.81	0.71
Purchase of adulterated drugs	2.13*	0.79
Poor storage facilities	1.51	0.63
Poor access to modern technologies	1.43	0.60

***serious challenge**

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Poor access to water poses a great challenge to farmers in maintaining a healthy farm, particularly in concrete and moveable tapeline homestead ponds. According to Foster and Smith (2015) attention to water used in fish farming begins at the source, because water contains a lot of chemicals which might be harmful to fishes, and water clarity is not a true indicator of water quality. Moreover, Kueh (2009) also noted the problem of increased causal agents present in the aquatic environment, either occurring naturally or were previously introduced and have become endemic in the area. Besides, the increasing environmental pollution associated with climate change on all sectors of the economy and agriculture in particular favours the

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multiplication of different strains of diseases and parasites. Personal communication revealed that when confronted with these challenges, farmers sell off the whole fish at a cheaper rate and this constitutes a huge loss to the farmer

Public emphasis has been on indiscriminate use of drugs due to the residual effects of some drugs, to the neglect of challenges of adulterated drugs, which largely impede effective and safe health management of fish. Often, farmers are advised to integrate health management practices mainly with the use of traditional methods (use of salt, lime). However, there are instances where use of drugs especially antibiotics become necessary, particularly with resistant bacteria and in severe cases. Thus, farmers face the problem of where to purchase quality drugs and this makes them resort to over- the counter medication.

Conclusion and Recommendations

Small scale fish farms are challenged by different management related diseases problems. Management related diseases occurred at different stages of fish growth with high dependence on fellow farmers for treatment. Farmers employed both traditional and orthodox measures in the treatment and management of disease incidence in their farms. However, poor access to quality source of water, standard drugs and quality feeds constituted the major problems in disease and health management in farms. Agricultural development agencies should strengthen technical assistance and extension services to farmers, through timely farm visits, consultation and monitoring of the health status of farms. There is need to intensify tailored trainings, particularly for new entrants to build adequate technical skill on proper fish culture, and health management. Also, agencies (Fisheries Society of Nigeria (FISON), State Department of Fisheries (SDF)), should strategically organize seminars, workshops, conferences and advisory services to build farmers capability to combat problems of managing disease in farms.

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